

Customer No.: 31561  
Application No.: 10/710,488  
Docket No.: 10304-US-PA

AMENDMENT

To the Claims:

1. (currently amended) A method of reducing pattern pitch on a substrate, comprising the steps of:
  - forming a material layer over the substrate;
  - forming a hard mask layer over the material layer;
  - forming a patterned photoresist layer over the hard mask layer to expose a region;
  - etching the hard mask layer using the patterned photoresist layer as etching mask, wherein due to the trenching effect, a residual hard mask layer remains in the exposed region and a plurality of micro-trenches are formed at the edges of the residual hard mask layer in the exposed region;
  - patterning the material layer using the residual hard mask layer as etching mask; and
  - removing the patterned photoresist layer and the hard mask layer.
2. (original) The method of claim 1, wherein the step of forming the hard mask layer over the material layer includes the sub-steps of:
  - forming a thin mask layer over the material layer; and
  - forming a thick mask layer over the thin mask layer.
3. (original) The method of claim 2, wherein the step of etching the hard mask layer using the patterned photoresist layer includes the sub-steps of:

Customer No.: 31561  
Application No.: 10/710,488  
Docket No.: 10304-US-PA

etching the thick mask layer using the patterned photoresist layer as etching mask, wherein due to the trenching effect, a residual thick hard mask layer remains in the exposed region and the micro-trenches are formed in the thick hard mask layer; and patterning the thin mask layer using the patterned photoresist layer and the residual thick mask layer as etching mask.

4. (original) The method of claim 2, wherein the etching selectivity ratio of the thick mask layer to the thin mask layer is greater than 1.
5. (original) The method of claim 2, wherein the etching selectivity ratio of the thin mask layer to the material layer is greater than 10.
6. (original) The method of claim 4, wherein the thick mask layer includes a silicon nitride layer.
7. (original) The method of claim 4, wherein the thin mask layer includes a silicon oxide layer.
8. (original) The method of claim 5, wherein the material layer includes a polysilicon layer.
9. (original) The method of claim 1, wherein after the micro-trenches are formed, an additional isotropic etching step is conducted to regulate the width of the micro-trenches.
- 10.(currently amended) A method of forming a patterned mask for reducing pattern pitch, comprising the steps of:  
forming a mask layer over a substrate;

Customer No.: 31561  
Application No.: 10/710,488  
Docket No.: 10304-US-PA

forming a patterned photoresist layer over the mask layer;  
etching the mask layer using the patterned photoresist layer as etching mask, wherein due to the trenching effect, a residual mask layer remains in an exposed region and a plurality of micro-trenches are formed at the edges of the residual mask layer in the exposed region; and  
removing the patterned photoresist layer.

11. (original) The method of claim 10, wherein the mask layer includes a silicon nitride layer.

12. (original) The method of claim 10, wherein the mask layer includes a silicon oxide layer.

13. (original) The method of claim 10, wherein the step of forming the mask layer over the substrate includes the sub-steps of:

forming a thin mask layer over the substrate; and

forming a thick mask layer over the thin mask layer.

14. (original) The method of claim 13, wherein the step of etching the mask layer using the patterned photoresist layer as etching mask includes the sub-steps of:

etching the thick mask layer using the patterned photoresist layer as etching mask, wherein due to the trenching effect, a residual thick mask layer remains in the exposed region and the micro-trenches are formed in the thick mask layer; and

patterning the thin mask layer using the patterned photoresist layer and the residual thick mask layer as etching mask.

Customer No.: 31561  
Application No.: 10/710,488  
Docket No.: 10304-US-PA

15. (original) The method of claim 13, wherein the etching selectivity ratio of the thick mask layer to the thin mask layer is greater than 1.
16. (original) The method of claim 15, wherein the thick mask layer includes a silicon nitride layer.
17. (original) The method of claim 15, wherein the thin mask layer includes a silicon oxide layer.
18. (original) The method of claim 10, wherein after the micro-trenches are formed, an additional isotropic etching step is conducted to regulate the width of the micro-trenches.
19. (currently amended) A method of reducing pattern pitch on a substrate, comprising the steps of:
  - forming a material layer over the substrate;
  - forming a patterned mask layer on the material layer to expose a region;
  - performing an etching process by using the patterned mask layer as etching mask for forming micro-trenches in the material layer, wherein a residual material layer remains in the exposed region and the micro-trenches are formed along sidewalls of the patterned mask layer;
  - and
  - removing the patterned mask layer.
20. (original) The method of claim 19, wherein the etching process comprises a reactive ion etching process.

Customer No.: 31561  
Application No.: 10/710,488  
Docket No.: 10304-US-PA

21. (original) The method of claim 20, wherein the bias power of the reactive ion etching process is lower than 150 W, and the source bias power is higher than 500 W.

22. (original) The method of claim 20, wherein the reactive gas of the reactive ion etching process comprises chlorine when the material layer is a polysilicon layer and the patterned mask layer is a silicon oxide layer.